Fig. 2

100 — Total Sequence Motor Test

101 — Test PWM Interface

OK?

Yes

No

102 — Error Message "PWM interface faulty"

103 — Motor Test With current measurement

104 — Abort because of IGBT error?

Yes

No

103a — Error during motor test ?

Yes

106 — Test for phase short circuit

Short circuit detected?

Yes

No

108 — Test for line-to-ground fault

107 — Error Message: Phase short circuit

Error Report: Line-to-ground fault or IGBT short circuit

105 — Error Message: Phase open, or IGBT does not switch on

End

+5V

Test.Out

59

≥1

58

=1

Test-Enable

57

=1

54

56

=1

Low Voltage Error

53

51

52

55

PWM.U1

PWM.U2

PWM.U3
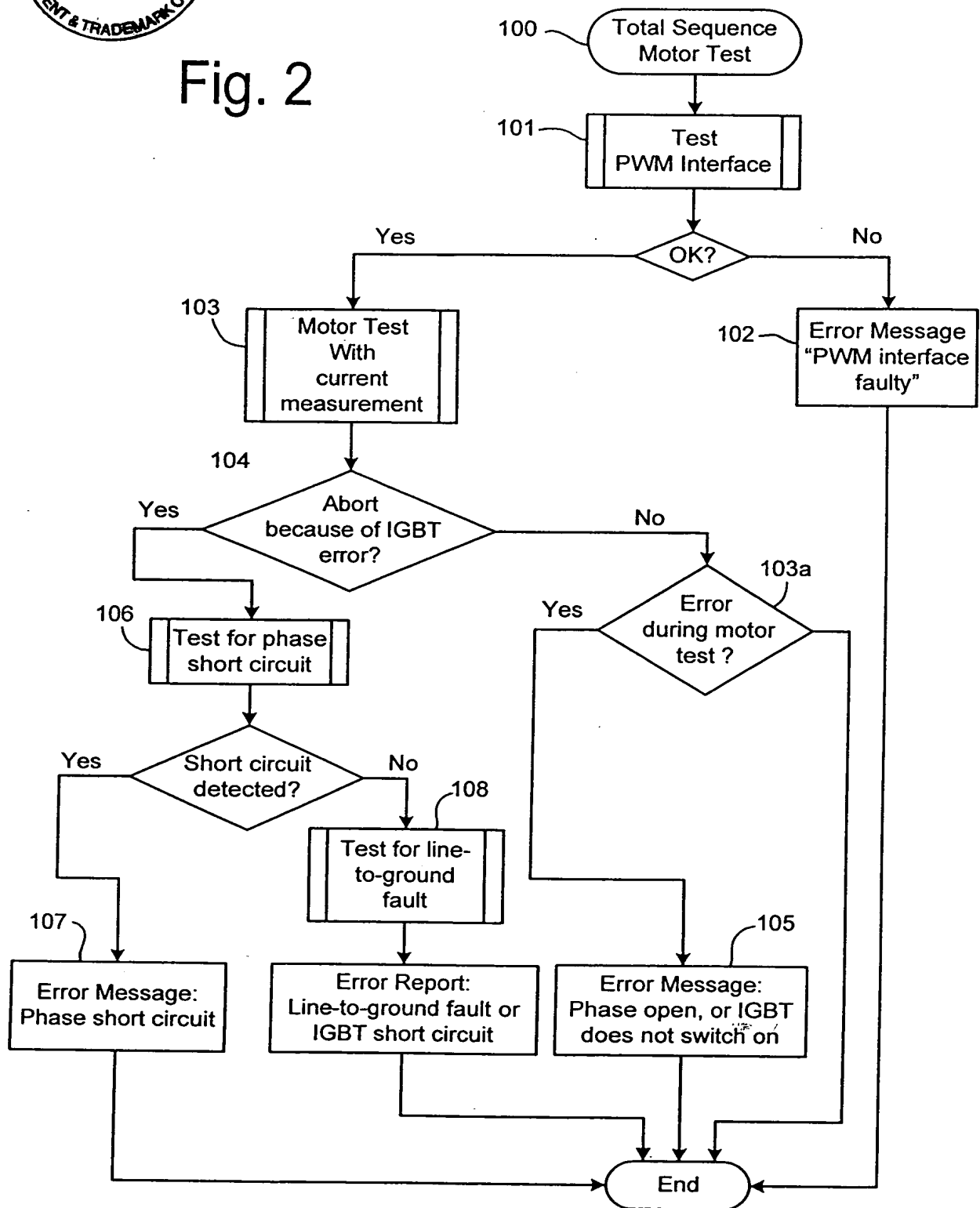
≥1

-SH1

-SH2

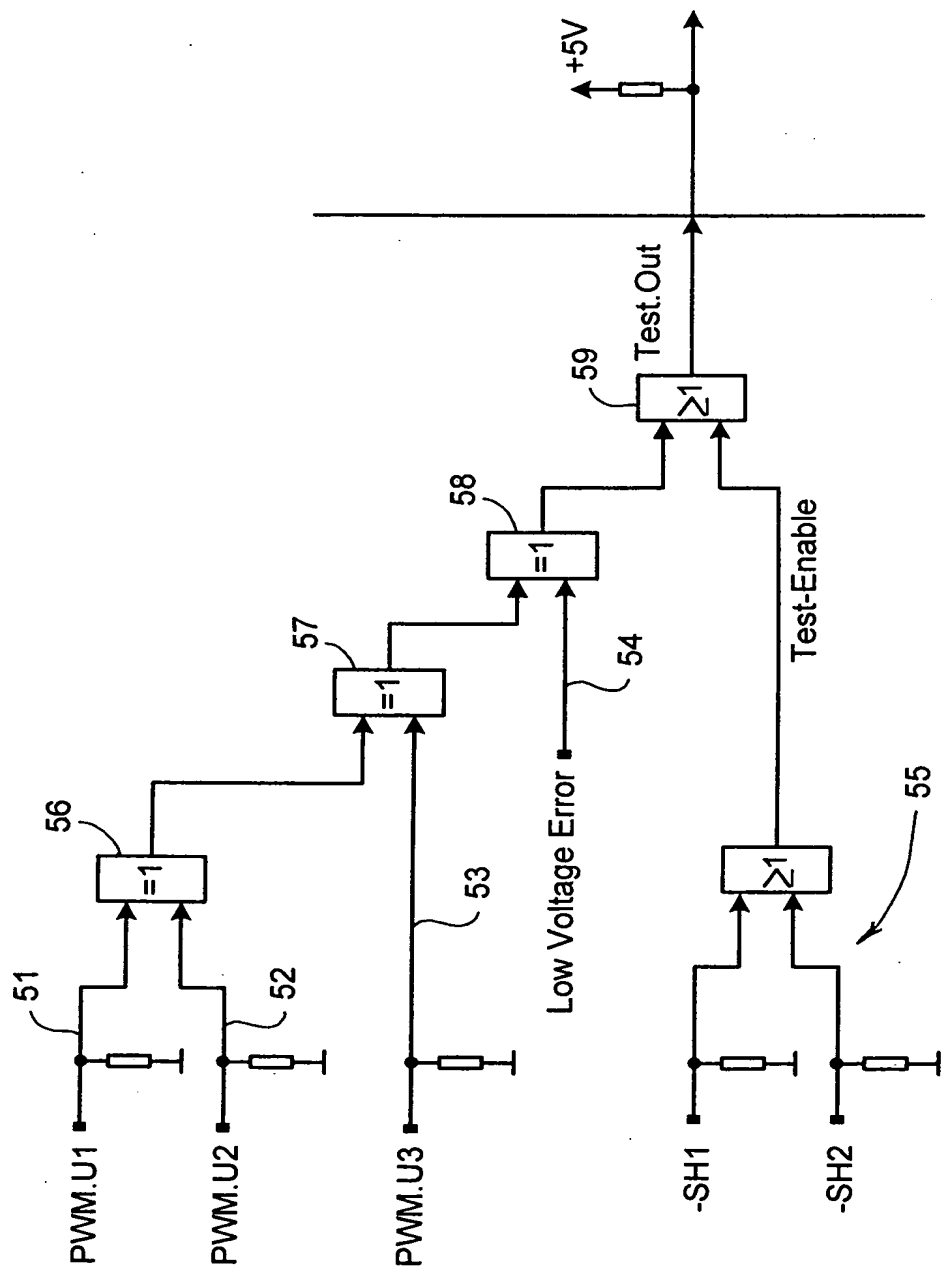Fig. 3

Fig. 4

PWM - Signals
PWM1: 0 1 0 0 1 0 1 1
PWM2: 0 0 1 0 1 1 0 1
PWM3: 0 0 0 1 1 1 1 0

<u>Test. Out:</u>

Low Voltages   OK

    1, 0, 0, 0, 0, 1, 1, 1 // all   OK

    1, 1, 0, 0, 1, 1, 0, 0 // PWM.U1 Stuck on 0
    1, 0, 1, 0, 1, 0, 1, 0 // PWM.U2 Stuck on 0
    1, 0, 0, 1, 1, 0, 0, 1 // PWM.U3 Stuck on 0

    1, 1, 1, 0, 0, 0, 0, 1 // PWM.U1 = PWM.U2
    1, 0, 1, 1, 0, 1, 0, 0 // PWM.U2 = PWM.U3
    1, 1, 0, 1, 0, 0, 1, 0 // PWM.U1 = PWM.U3
    1, 0, 0, 0, 0, 0, 0, 0 // PWM.U1 = PWM.U2 = PWM.U3

Low Voltages   Faulty

    0, 1, 1, 1, 1, 0, 0, 0 // PWM Signals   OK

    0, 0, 1, 1, 0, 0, 1, 1 // PWM.U1 Stuck on 0 + low voltage
    0, 1, 0, 1, 0, 1, 0, 1 // PWM.U2 Stuck on 0 + low voltage
    0, 1, 1, 0, 0, 1, 1, 0 // PWM.U3 Stuck on 0 + low voltage

    0, 0, 0, 1, 1, 1, 1, 0 // PWM.U1 = PWM.U2 + low voltage
    0, 1, 0, 0, 1, 0, 1, 1 // PWM.U2 = PWM.U3 + low voltage
    0, 0, 1, 0, 1, 1, 0, 1 // PWM.U1 = PWM.U3 + low voltage
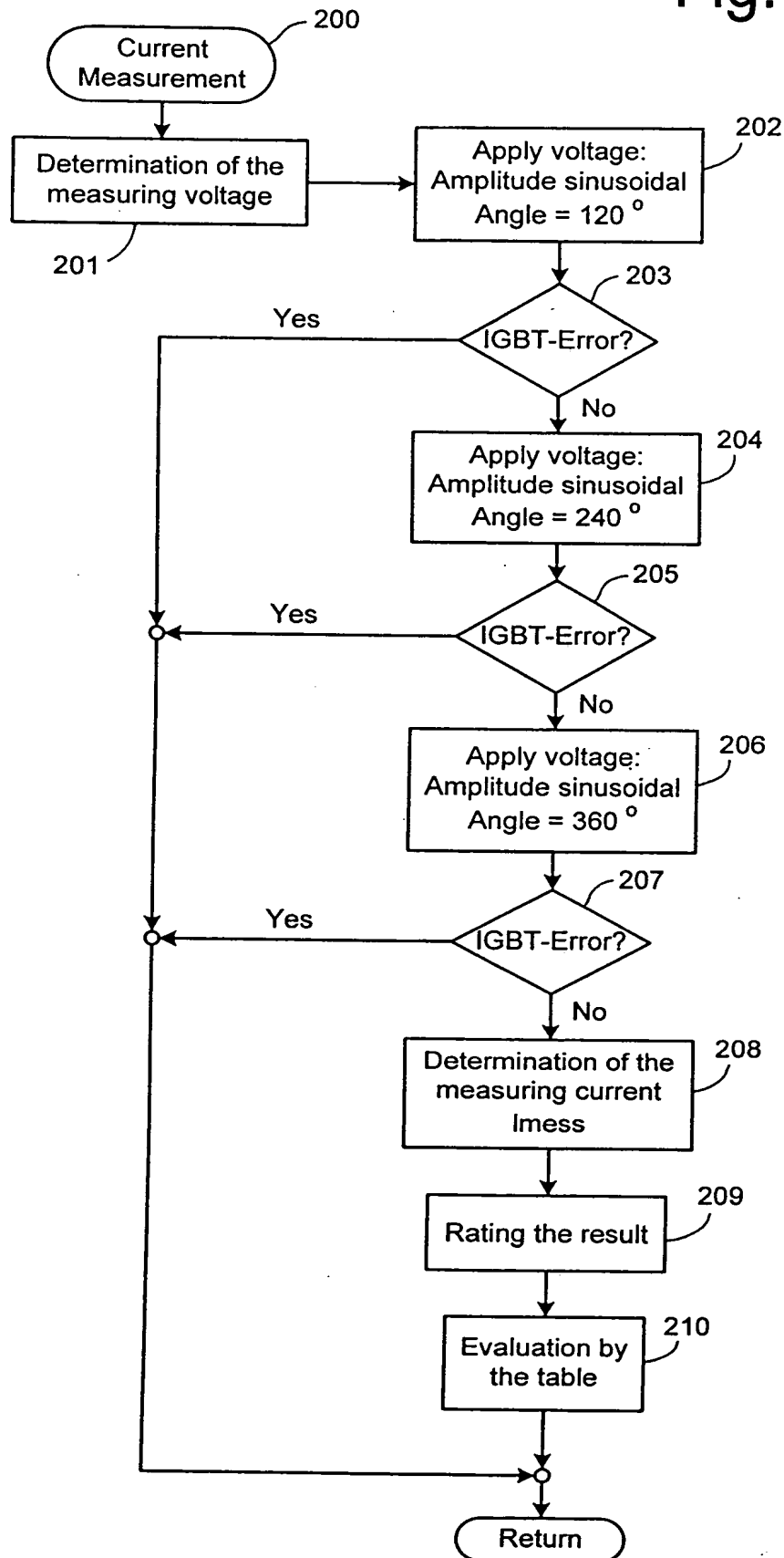   0, 1, 1, 1, 1, 1, 1, 1 // PWM.U1 = PWM.U2 = PWM.U3 + low voltage

General errors

    0, 0, 0, 0, 0, 0, 0, 0 // SH1 or SH2 not "0"
    1, 1, 1, 1, 1, 1, 1, 1 // Test – output open

Fig. 5

```
      ┌─────────────────┐ ─── 200
      │     Current     │
      │   Measurement   │
      └─────────────────┘
               │
               ▼
   ┌─────────────────────┐      ┌─────────────────────┐ ── 202
   │ Determination of the │─────▶│   Apply voltage:     │
   │  measuring voltage   │      │ Amplitude sinusoidal │
   └─────────────────────┘      │   Angle = 120 °      │
            201                  └─────────────────────┘
                                           │
                                           ▼  ── 203
                    Yes          ◇ IGBT-Error? ◇
          ◀────────────────────────
                                           │ No
                                           ▼
                                 ┌─────────────────────┐ ── 204
                                 │   Apply voltage:     │
                                 │ Amplitude sinusoidal │
                                 │   Angle = 240 °      │
                                 └─────────────────────┘
                                           │
                                           ▼  ── 205
                    Yes          ◇ IGBT-Error? ◇
          ◀────○──────────────────
                                           │ No
                                           ▼
                                 ┌─────────────────────┐ ── 206
                                 │   Apply voltage:     │
                                 │ Amplitude sinusoidal │
                                 │   Angle = 360 °      │
                                 └─────────────────────┘
                                           │
                                           ▼  ── 207
                    Yes          ◇ IGBT-Error? ◇
          ◀────○──────────────────
                                           │ No
                                           ▼
                                 ┌─────────────────────┐ ── 208
                                 │ Determination of the │
                                 │  measuring current   │
                                 │       Imess          │
                                 └─────────────────────┘
                                           │
                                           ▼
                                 ┌─────────────────────┐ ── 209
                                 │  Rating the result   │
                                 └─────────────────────┘
                                           │
                                           ▼
                                 ┌─────────────────────┐ ── 210
                                 │    Evaluation by     │
                                 │     the table        │
                                 └─────────────────────┘
                                           │
          └────────────────────────────────○
                                           ▼
                                  (   Return   )
```

	U1	U2	U3	Result: -ERR / No short circuit	No short circuit Phase 11-12	No short circuit Phase 11-13	No short circuit Phase 12-13	Perform test for Line-to-ground fault
Measurement Step 1	U	-U/2	-U/2	1	0	0	1	0
Measurement Step 2	-U/2	U	-U/2	1	0	1	0	0
Measurement Step 3	-U/2	-U/2	U	1	1	0	0	0

Fig. 17

Test for line-to-ground fault — 400

PWM.U123="000" — 401

Store IGBT error as Err0 — 402

PWM.U123="111" — 403

Store IGBT error as Err1 — 404

Err0 & & Err1 — 405

Yes → Error message Indicate line-to-ground fault — 406

No → Err0 — 407

Yes → IGBT of +UZ has a short circuit — 408

No → Err1 — 409

Yes → IGBT of -UZ has a short circuit — 411

No → Unknown Error — 412

Fig. 18